

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SHINKO KOGYO CO LTD

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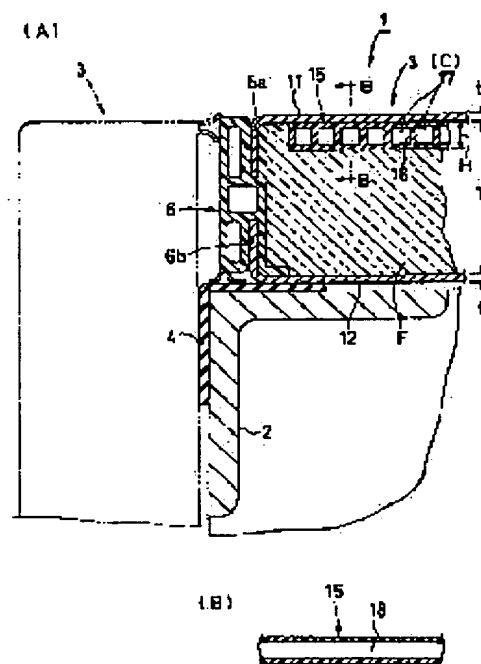
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UCHIDA KENJI

(54) EXTERNAL WALL PANEL OF AIR CONDITIONER

(57)Abstract:

PROBLEM TO BE SOLVED: To achieve a higher soundproofing performance of an external wall panel of an air conditioner.

SOLUTION: An external wall panel 3 is provided with a rim member 6 made of a synthetic resin in a square, an outer plate 11 made of metal mounted on the upper side of the square member 6, an inner plate 12 made of metal mounted on the lower side of the square member 6 and a soundproofing material 15 joined on the internal surface of the outer plate 11. The soundproofing material 15 is made up of a sheet made of the synthetic resin and provided with a number of columnar spacer 17 made horizontally at a specified interval. Foam F is packed into a space surrounded by the rim member 6, the outer plate 11, the soundproofing material 15 and the inner plate 12.



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CLAIMS

[Claim(s)]

[Claim 1] The metal shell plate attached in the lateral surface of the edge material (6) formed in the shape of a frame with synthetic resin, and its edge material (6) (11), The metal inner plate attached in the medial surface of edge material (6) same as the above (12), It has the sound insulating material (15) which one [at least] inside of the inside of the above-mentioned shell plate (11) and the inside of the above-mentioned inner plate (12) was made to join. The outer wall panel of the air conditioner characterized by what the space surrounded with the above-mentioned edge material (6), the above-mentioned shell plate (11) and the inner plate (12), and the above-mentioned sound insulating material (15) was filled up with foam (F) for.

[Claim 2] The metal shell plate attached in the lateral surface of the edge material (6) formed in the shape of a frame with synthetic resin, and its edge material (6) (11), The metal inner plate attached in the medial surface of edge material (6) same as the above (12), The sound insulating material which either inside of the inside of the above-mentioned shell plate (11) and the inside of the above-mentioned inner plate (12) was made to join (15), The outer wall panel of the air conditioner characterized by what it had another sound insulating material which the inside of another side was made to join, and the space surrounded with the above-mentioned edge material (6), the above-mentioned shell plate (11) and the inner plate (12), the above-mentioned sound insulating material (15), and another sound insulating material was filled up with foam (F) for.

[Claim 3] The outer wall panel of the air conditioner characterized by what the aforementioned sound insulating material (15) consists of a sheet equipped with a part for a centrum (C) made of synthetic resin in the outer wall panel of the air conditioner indicated to claim 1 or 2.

[Claim 4] The outer wall panel of the air conditioner characterized by what the hemispherical opening (19) of a large number distributed in the outer wall panel of the air conditioner indicated to claim 3 in the direction which intersects perpendicularly to the thickness direction of the sound insulating material (15) of the aforementioned sheet form constituted the part for an aforementioned centrum (C) for.

[Claim 5] The outer wall panel of the air conditioner characterized by what the pillar-shaped opening (17) of a large number which opened and prepared predetermined spacing in the direction which intersects perpendicularly to the thickness direction of the sound insulating material (15) of the aforementioned sheet form in the outer wall panel of the air conditioner indicated to claim 3 constituted the part for an aforementioned centrum (C) for.

[Claim 6] The outer wall panel of the air conditioner characterized by what the aforementioned foam (F) consists of mixture with the very fine particle of the minerals which used the foaming ingredient and silicon dioxide made of synthetic resin as the principal component in the outer wall panel of the air conditioner indicated to either of claims 1-5.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the panel used as an outer wall of casing of an air conditioner.

[0002]

[Description of the Prior Art] The outer wall panel of this kind of air conditioner has some which filled up with and constituted foam, such as urethane resin, from the former between the shell plates and inner plates which have opened and arranged predetermined spacing.

[0003]

[Problem(s) to be Solved by the Invention] Although the above-mentioned conventional outer wall panel was excellent in the point that the cold energy or **** in casing can prevent escaping to the exterior by foam, such as urethane resin, the improvement was demanded when reducing the noise of the fan who installed in casing. The purpose of this invention is to raise the sound isolation engine performance of the outer wall panel of an air conditioner. [0004]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention of claim 1 constituted the outer wall panel of an air conditioner as follows, as shown in each drawing of drawing 1 , drawing 3 , drawing 5 , and drawing 7 R> 7. Namely, the edge material 6 formed in the shape of a frame with synthetic resin and the metal shell plate 11 attached in the lateral surface of the edge material 6, It has the sound insulating material 15 which one [at least] inside of the metal inner plate 12 attached in the medial surface of the edge material 6 same as the above, and the inside of the above-mentioned shell plate 11 and the inside of the above-mentioned inner plate 12 was made to join. It is characterized by what the space surrounded with the above-mentioned edge material 6, the above-mentioned shell plate 11 and the inner plate 12, and the above-mentioned sound insulating material 15 was filled up with Foam F for. In addition, in the above-mentioned configuration, the above-mentioned sound insulating material 15 has three cases of the case where it is joined by only the inside of a shell plate 11, the case where it is joined by only the inside of an inner plate 12, and the case where it is joined by the inside of an inner plate 12 while being joined by the inside of a shell plate 11.

[0005] Invention of above-mentioned claim 1 does the following operation effectiveness so. For example, first, it decreases by the inner plate and foam of an outer wall panel, and the noise energy which originates in the fan in casing etc. when a sound insulating material is joined only to the inside of a shell plate is decreased with the joined sound insulating material, it is decreased with the above-mentioned shell plate, and, subsequently to the inside of a shell plate, is spread out of casing after that. For this reason, the transmission loss of an outer wall panel becomes large, and the sound isolation engine performance improves. Moreover, when a sound insulating material is joined only to the inside of an inner plate, it acts like the above and the sound isolation engine performance improves. And while joining a sound insulating material to the inside of a shell plate, when a sound insulating material is joined also to the inside of an inner plate, the sound isolation engine performance improves further.

[0006] and -- the time of manufacturing the above-mentioned outer wall panel -- one [at least] inside of the inside of a shell plate, and the inside of an inner plate -- a sound insulating material -- beforehand -- joining - the shell plate and inner plate -- edge material -- attaching -- the edge material of the above after that, the above-mentioned shell plate and an inner plate, and the above-mentioned sound insulating material -- ** -- what is necessary is just to fill up with foam the space surrounded as be alike Thus, since what is necessary is just to join the sound insulating material to at least one side of a shell plate and an inner plate beforehand, manufacture of an outer wall panel does not take time and effort.

[0007] Moreover, in order to attain the aforementioned purpose, invention of claim 2 constituted the outer wall panel of an air conditioner as follows, as shown in each drawing of for example, drawing 1, drawing 3, drawing 5, and drawing 7. Namely, the edge material 6 formed in the shape of a frame with synthetic resin and the metal shell plate 11 attached in the lateral surface of the edge material 6, The sound insulating material 15 which either inside of the metal inner plate 12 attached in the medial surface of the edge material 6 same as the above, and the inside of the above-mentioned shell plate 11 and the inside of the above-mentioned inner plate 12 was made to join, It has another sound insulating material which the inside of another side was made to join, and is characterized by what the space surrounded with the above-mentioned edge material 6, the above-mentioned shell plate 11 and the inner plate 12, the above-mentioned sound insulating material 15, and another sound insulating material was filled up with Foam F for.

[0008] According to invention of above-mentioned claim 2, by combining the sound insulation construction of the above-mentioned sound insulating material, the quality of the material and the sound insulation construction of the another above-mentioned sound insulating material, or the quality of the material, the sound isolation engine performance of a desired frequency domain is improved, or it becomes possible from low frequency to raise the sound isolation engine performance in all the fields of high frequency.

[0009] In above-mentioned claim 1 or invention of 2, constituting, as shown in claim 3 is desirable. That is, as shown, for example in drawing 1 or drawing 5, the sheet equipped with the centrum part C made of synthetic resin constitutes the aforementioned sound insulating material 15. According to invention of the claim 3, since noise energy is absorbable with the gas in the above-mentioned centrum part (for example, air), the sound isolation engine performance improves.

[0010] In the configuration of claim 3, invention of claim 4 constitutes the aforementioned centrum part C by the hemispherical opening 19 of a large number distributed in the direction which intersects perpendicularly to the thickness direction of the sound insulating material 15 of the aforementioned sheet form, as shown in drawing 5. Since invention of the claim 4 can absorb noise energy efficiently with the gas in many hemispherical openings, its sound isolation engine performance improves further. And since the sound insulating material of a sheet form formed the above-mentioned opening in the shape of a semi-sphere, it can prevent deformation by the blowing pressure force and external force of foam.

[0011] In the configuration of aforementioned claim 3, invention of claim 5 constitutes the aforementioned centrum part C by the pillar-shaped opening 17 of a large number which opened and prepared predetermined spacing in the direction which intersects perpendicularly to the thickness direction of the sound insulating material 15 of the aforementioned sheet form, as shown in drawing 1. Since invention of the claim 5 can absorb noise energy with the gas in many pillar-shaped openings, its sound isolation engine performance improves. And the sound insulating material of a sheet form can have reinforcement high in comparison with the rib which divides between adjacent openings.

[0012] Invention of claim 6 is characterized by what is consisted of mixture with the very fine particle of the minerals with which the aforementioned foam F used the foaming ingredient and silicon dioxide made of synthetic resin as the principal component in one configuration of above-mentioned claims 1-5. According to invention of above-mentioned claim 6, the noise insulation engine performance of an outer wall panel can be improved according to the weight effectiveness of the very fine particle mixed in foam etc. And since the very fine particle is the minerals which use a silicon dioxide as a principal component, recycle of an outer wall panel is easy.

[0013]

[Embodiment of the Invention] (The 1st operation gestalt) Drawing 1 and drawing 2 show the 1st operation gestalt of this invention. First, the structure of the outer wall panel applied to this invention by drawing 1 (A) and drawing 1 (B) is explained. Drawing 1 (A) shows the cross-sectional-view partial diagrammatic view of the casing 1 of an air conditioner, and drawing 1 (B) is the sectional view of the sound insulating material 15 in the B-B line view in above-mentioned drawing 1 (A).

[0014] The above-mentioned casing 1 can be equipped with a frame 2, and two or more outer wall panels 3-3 can detach and attach freely on the external surface of the frame 2, and it is fixed in the shape of an airtight. A sign 4 is a gasket. The above-mentioned outer wall panel 3 is equipped with the frame-like edge material 6 by the product made of synthetic resin. While attaching the metal shell plate 11 in slot 6a outside the lateral surface (here top side) of the edge material 6, the metal inner plate 12 is attached in inner slot 6b of the medial surface (here bottom side) of the edge material 6 same as the above. and the inside of the above-mentioned shell plate 11 -- the sound insulating material 15 is mostly joined to the whole surface. As the junction approach, it is possible to use adhesives and a double-sided tape. [0015] The above-mentioned sound insulating material 15 is constituted by the sheet equipped with the centrum part C made of synthetic

resin. If it says in more detail, the centrum part C is constituted by many pillar-shaped openings 17, and it is prolonged for a long time to the longitudinal direction in drawing 1 (B) while these pillar-shaped openings 17 open predetermined spacing in the direction (here longitudinal direction in drawing 1 (A)) which intersects perpendicularly to the thickness direction of the sound insulating material 15 of the above-mentioned sheet form and are established in it. The sign 18 in drawing is a rib which divides the adjacent opening 17-17. In addition, although the above-mentioned pillar-shaped opening 17 is mostly illustrated in the square cross-section configuration, the cross-section configuration may be a rectangle, a parallelogram, or a round shape.

[0016] It fills up with the foam F which equipped with adiathermic and soundproofing the panel space surrounded by the above-mentioned edge material 6, the above-mentioned shell plate 11, and a sound insulating material 15 and the above-mentioned inner plate 12. The foam F makes the foaming ingredient which combined urethane resin and a foaming agent have foamed by the well-known approach.

[0017] Drawing 2 is a graph which shows the test result which compared the above-mentioned 1st operation gestalt and the above-mentioned example of a comparison, and shows the relation between transmission loss and a frequency. The outer wall panel 3 for a trial concerning the above-mentioned 1st operation gestalt is constituted as follows, as shown in aforementioned drawing 1.

[0018] What plated to the rolled plate whose board thickness t is about 0.6mm is used for a shell plate 11 and an inner plate 12, and a vertical dimension is [form width] about 840mm in about 540mm. The thickness of the outer wall panel 3 is about 30mm, therefore T dimension in drawing 1 is about 29mm. The parallel rib structure made from polypropylene (thump rye by Sumitomo Chemical Co., Ltd.) was used for the aforementioned sound insulating material 15, in the example of the 1st test, that (surface density: 0.5kg/m²) whose thickness H of the above-mentioned thump rye is about 3mm was used for it, and that (surface density: 1.2 kg/m²) whose thickness H of thump rye same as the above is about 5mm was used for it by the example of the 2nd test.

[0019] The consistencies after the foaming of Foam F were 40 kg/m³ using the combination of urethane resin and a foaming agent. The surface density of the outer wall panel 3 of the above-mentioned configuration was 12.79 kg/m² in the example of the 1st test, and was 13.01 kg/m² in the example of the 2nd test. In addition, at the time of the trial of transmission loss, the periphery edge of the above-mentioned outer wall panel 3 was fixed to the duct for a trial with six bolts arranged mostly at equal intervals.

[0020] On the other hand, the outer wall panel for a trial concerning the example of a comparison differs from the outer wall panel 3 for a trial which requires for the 1st operation gestalt only the point of having not formed the aforementioned sound insulating material 15. In addition, the surface density of the outer wall panel of the example of a comparison was 12.13 kg/m².

[0021] According to the test result of above-mentioned drawing 2, the 1st operation gestalt (the example of the 1st test and the example of the 2nd test) of this invention became distinct [that the sound isolation engine performance can be improved in a less than 500Hz low frequency field] compared with the example of a comparison.

[0022] Drawing 8 shows the 2nd operation gestalt to the 4th operation gestalt from drawing 3. In another operation gestalt of these, the same sign is attached to the member of the same configuration as the above-mentioned 1st operation gestalt, and only a different configuration from the 1st operation gestalt is explained.

[0023] (The 2nd operation gestalt) Drawing 3 and drawing 4 show the 2nd operation gestalt of this invention. Drawing 3 is drawing equivalent to aforementioned drawing 1, and drawing 4 is drawing equivalent to aforementioned drawing 2. In this case, the solid sheet with the amount of nothing centrum is used for the aforementioned sound insulating material 15. When saying more concretely, the noise insulation sheet (brand-name "Edie Kel" M-4000 by NIHON TOKUSHU TORYO CO., LTD.) of a rubber network was used for the sound insulating material 15, by the example of the 3rd test, that (surface density: about 3.5 kg/m²) whose thickness H of the above-mentioned noise insulation sheet is about 2mm was used for it, and that (surface density: about 5 kg/m²) whose thickness H of a noise insulation sheet same as the above is about 3mm was used for it in the example of the 4th test. In addition, the surface density of the outer wall panel 3 of the above-mentioned configuration was 15.65 kg/m² in the example of the 3rd test, and was 17.20 kg/m² in the example of the 4th test.

[0024] According to the test result of above-mentioned drawing 4, the 2nd operation gestalt (the example of the 3rd test and the example of the 4th test) of this invention became distinct [that the sound isolation engine performance can be improved in a 2kHz frequency domain] from 125Hz compared with the aforementioned example of a comparison.

[0025] (The 3rd operation gestalt) Drawing 5 and drawing 6 show the 3rd operation gestalt of this invention. Drawing 5 is drawing equivalent to aforementioned drawing 1, and drawing 6 is drawing equivalent to aforementioned drawing 2. In this case, the cushioning material with an opening when packing up the object which is [glassware] easy to damage (the so-called air cap) is used for the aforementioned sound insulating material 15. If it says in more detail, the hemispherical opening 19 of a large number distributed in the direction which intersects perpendicularly to the thickness direction of a sound insulating material 15 constitutes the aforementioned centrum part C. In addition, thickness H of the whole sound insulating material 15 is about 3mm, and the radius of the above-mentioned hemispherical opening 19 is about 5mm. In addition, the surface density of the outer wall panel 3 of the above-mentioned configuration was 12.35 kg/m².

[0026] According to the test result of above-mentioned drawing 6, the 3rd operation gestalt (the example of the 5th test) of this invention became distinct [that the sound isolation engine performance can be improved in a frequency domain 125Hz or more] compared with the aforementioned example of a comparison.

[0027] (The 4th operation gestalt) Drawing 7 and drawing 8 show the 4th operation gestalt of this invention. Drawing 7 is drawing equivalent to aforementioned drawing 1, and drawing 8 is drawing equivalent to aforementioned drawing 2. In this case, the consistency constitutes [thickness H] the aforementioned sound insulating material 15 from about 10mm by the glass wool of about 40 kg/m³. In addition, the surface density of the outer wall panel 3 of the above-mentioned configuration was 12.35 kg/m².

[0028] According to the test result of above-mentioned drawing 8, the 4th operation gestalt (the example of the 6th test) of this invention became distinct [that the sound isolation engine performance can be improved in a frequency domain 1kHz or more] compared with the aforementioned example of a comparison.

[0029] Each above-mentioned operation gestalt can be changed still as follows. Mixture with the very fine particle of the minerals which used as the principal component the foaming ingredient and silicon dioxide made of the synthetic resin mentioned above may constitute the aforementioned foam F. As for the very fine particle, it is desirable to use what recycled glassware, such as glassware, in order to recycle a resource.

[0030] In addition, in order to reconcile good fizz the noise insulation disposition top of the above-mentioned foam F, constituting as follows is desirable. That is, the particle size of the aforementioned very fine particle is within the limits of 5.0mm from 10 micrometers, and it is that the above-mentioned very fine particle is within the limits of 20 to 95(volume) % to the sum of the aforementioned foaming ingredient and a very fine particle same as the above in the ingredient condition before foaming. Constituting as follows is still more desirable. That is, the particle size of the aforementioned very fine particle is within the limits of 1.2mm from 10 micrometers, and it is that the above-mentioned very fine particle is within the limits of 40 to 80(volume) % to the sum of the aforementioned foaming ingredient and a very fine particle same as the above in the ingredient condition before foaming. And according to the test result, when it was set as about 1:1 in the state of the ingredient before foaming in volume mixing proportion of the above-mentioned very fine particle and the above-mentioned foaming ingredient, it turned out that the noise insulation engine performance can be improved by about 2dB.

[0031] The approach of attaching the aforementioned shell plate 11 and the aforementioned inner plate 12 in the aforementioned edge material 6 may be replaced with attaching, and may be other mounting arrangements, such as a bis-stop and adhesion. An above-mentioned metal shell plate 11 and an above-mentioned metal inner plate 12 may be what performed surface treatment to the thing or aluminum which replaced with what plated to the steel plate, and painted to the steel plate.

[0032] The aforementioned sound insulating material 15 may be replaced with joining only to the inside of the above-mentioned shell plate 11, and may be joined only to the inside of the aforementioned inner plate 12. Furthermore, while joining a sound insulating material 15 to the inside of the above-mentioned shell plate 11, a sound insulating material 15 may be joined also to the inside of the above-mentioned inner plate 12.

[0033] Moreover, while joining the above-mentioned sound insulating material 15 to the inside of the above-mentioned shell plate 11, another sound insulating material may be joined to the inside of the above-mentioned inner plate 12. It replaces with this, and while joining the above-mentioned sound insulating material 15 to the inside of the above-mentioned inner plate 12, another sound insulating material may be joined to the inside of the above-mentioned shell plate 11. Although it is possible to use it as the another above-mentioned sound insulating material, choosing various kinds of sound insulating materials 15 of each aforementioned operation gestalt as arbitration, it does not interfere, even if each operation gestalt is the sound insulating material of a completely different class.

[Translation done.]

* NOTICES *

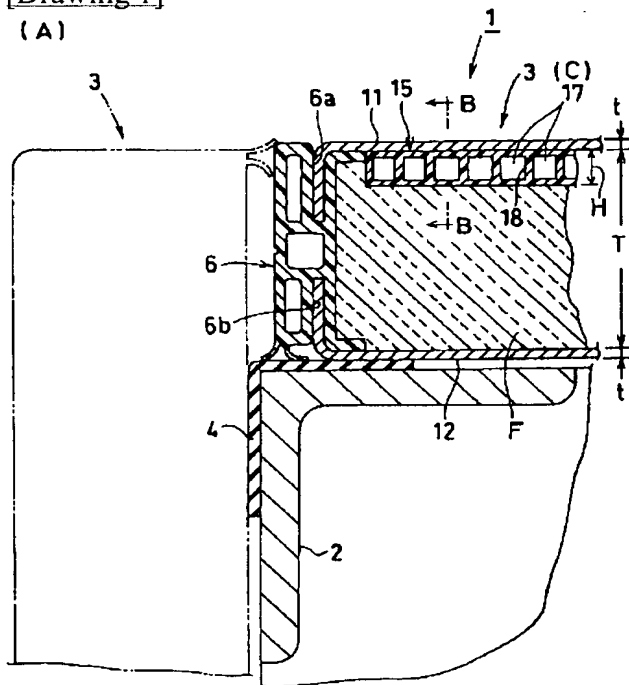
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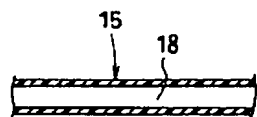
DRAWINGS

[Drawing 1]

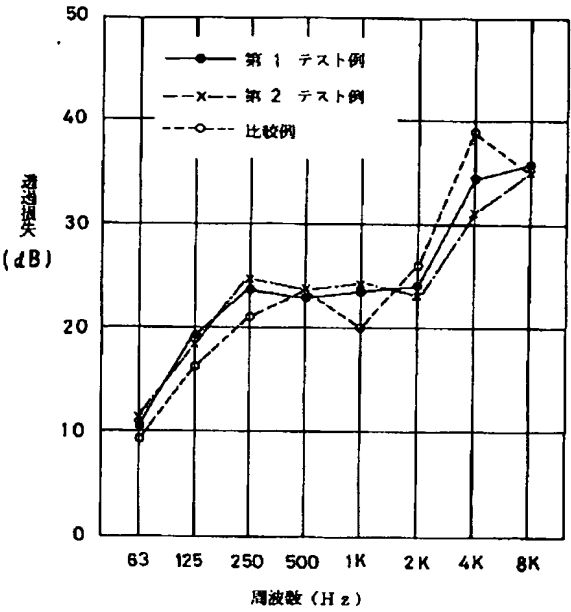
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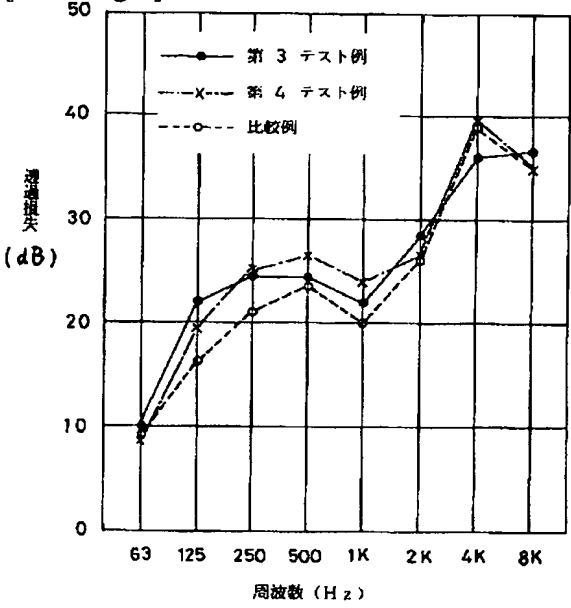
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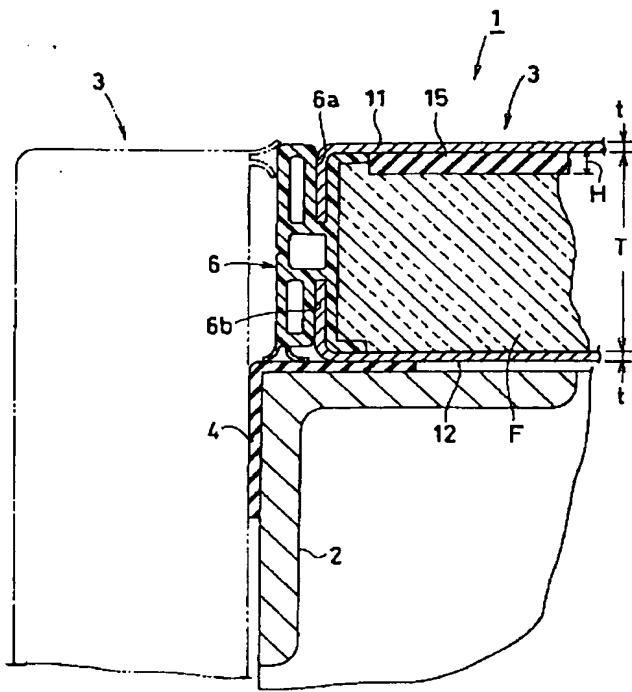
[Drawing 2]



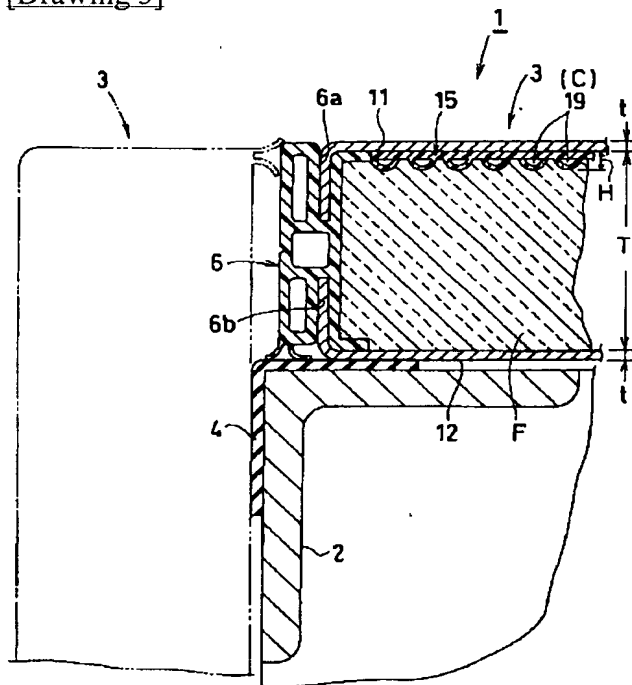
[Drawing 4]



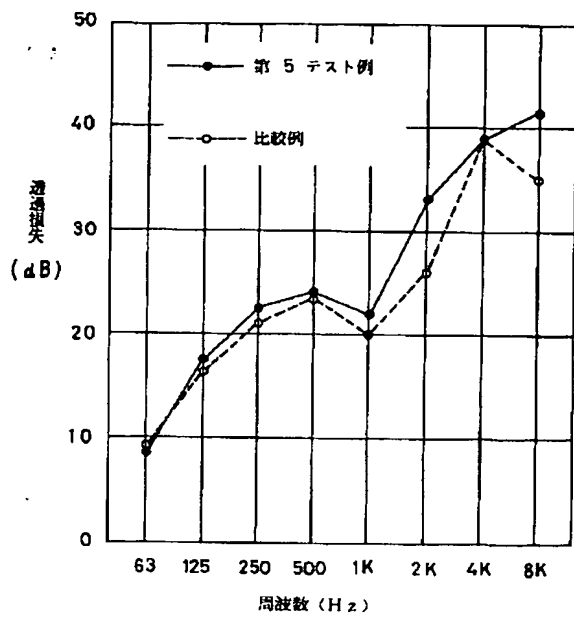
[Drawing 3]



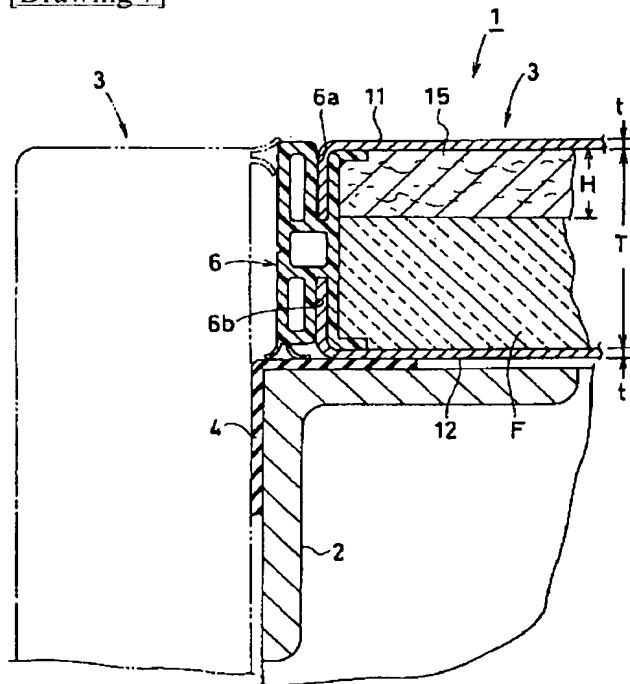
[Drawing 5]



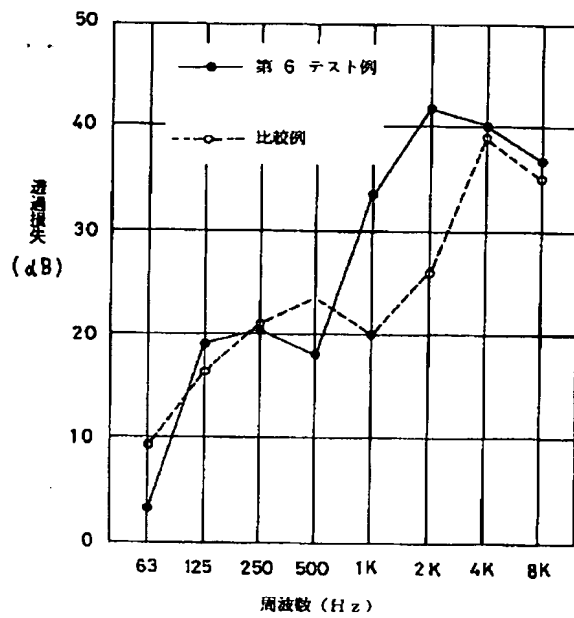
[Drawing 6]



[Drawing 7]



[Drawing 8]



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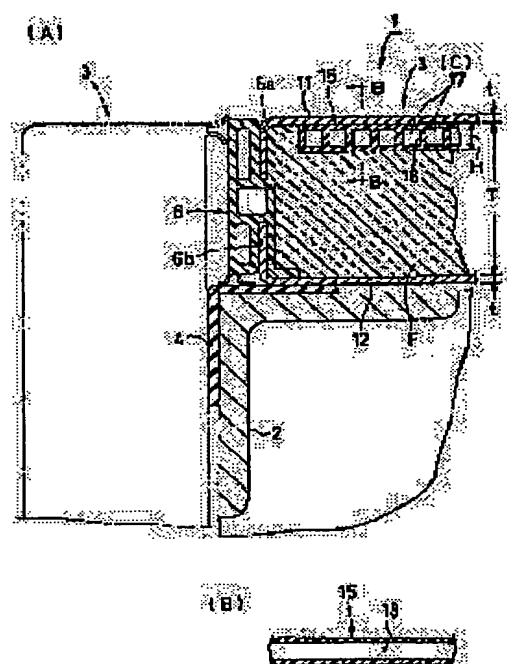
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SOLUTION: An external wall panel 3 is provided with a rim member 6 made of a synthetic resin in a square, an outer plate 11 made of metal mounted on the upper side of the square member 6, an inner plate 12 made of metal mounted on the lower side of the square member 6 and a soundproofing material 15 joined on the internal surface of the outer plate 11. The soundproofing material 15 is made up of a sheet made of the synthetic resin and provided with a number of columnar spacer 17 made horizontally at a specified interval. Foam F is packed into a space surrounded by the rim member 6, the outer plate 11, the soundproofing material 15 and the inner plate 12.



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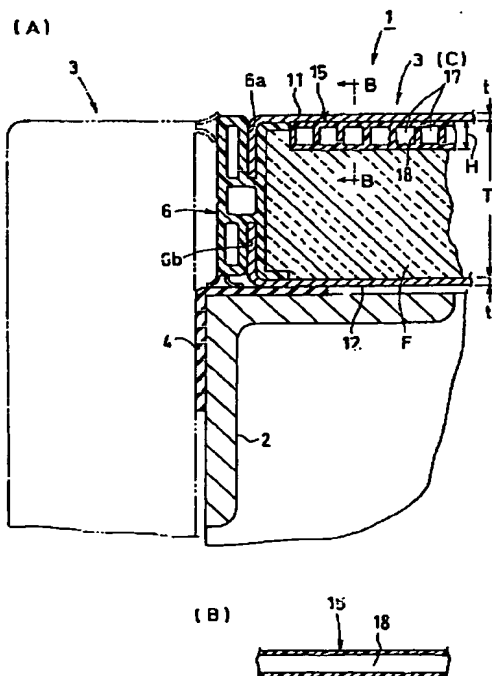
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(54) 【発明の名称】 空調装置の外壁パネル

(57) 【要約】

【課題】 空調装置の外壁パネルの防音性能を向上させる。

【解決手段】 外壁パネル3は、合成樹脂によって額縁状に形成した縁部材6と、その縁部材6の上側面に取付けた金属製の外板11と、同上の縁部材6の下側面に取付けた金属製の内板12と、上記の外板11の内面に接合させた防音材15とを備える。その防音材15は、合成樹脂製のシートからなり、水平方向へ所定の間隔をあけて設けた多数の柱状空隙17を備える。上記の縁部材6と上記の外板11および防音材15と上記の内板12とによって囲まれた空間に発泡体Fを充填する。



【特許請求の範囲】

【請求項1】 合成樹脂によって額縁状に形成した縁部材(6)と、その縁部材(6)の外側面に取り付けた金属製の外板(11)と、同上の縁部材(6)の内側面に取り付けた金属製の内板(12)と、上記の外板(11)の内面と上記の内板(12)の内面との少なくとも一方の内面に接合させた防音材(15)とを備え、上記の縁部材(6)と上記の外板(11)および内板(12)と上記の防音材(15)とによって囲まれた空間に発泡体(F)を充填した、ことを特徴とする空調装置の外壁パネル。

【請求項2】 合成樹脂によって額縁状に形成した縁部材(6)と、その縁部材(6)の外側面に取り付けた金属製の外板(11)と、同上の縁部材(6)の内側面に取り付けた金属製の内板(12)と、上記の外板(11)の内面と上記の内板(12)の内面とのいずれか一方の内面に接合させた防音材(15)と、他方の内面に接合させた別の防音材とを備え、上記の縁部材(6)と上記の外板(11)および内板(12)と上記の防音材(15)および別の防音材とによって囲まれた空間に発泡体(F)を充填した、ことを特徴とする空調装置の外壁パネル。

【請求項3】 請求項1又は2に記載した空調装置の外壁パネルにおいて、前記の防音材(15)が、中空部分(C)を備えた合成樹脂製のシートからなる、ことを特徴とする空調装置の外壁パネル。

【請求項4】 請求項3に記載した空調装置の外壁パネルにおいて、前記のシート形の防音材(15)の厚さ方向に対して直交する方向へ分布する多数の半球状空隙(19)によって前記の中空部分(C)を構成した、ことを特徴とする空調装置の外壁パネル。

【請求項5】 請求項3に記載した空調装置の外壁パネルにおいて、前記のシート形の防音材(15)の厚さ方向に対して直交する方向へ所定の間隔をあけて設けた多数の柱状空隙(17)によって前記の中空部分(C)を構成した、ことを特徴とする空調装置の外壁パネル。

【請求項6】 請求項1から5のいずれかに記載した空調装置の外壁パネルにおいて、前記の発泡体(F)が、合成樹脂製の発泡成形材料と二酸化ケイ素を主成分とした無機質の微細粒子との混合物からなる、ことを特徴とする空調装置の外壁パネル。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、空調装置のケーシングの外壁として使用するパネルに関する。

【0002】

【従来の技術】この種の空調装置の外壁パネルは、従来では、所定の間隔をあけて配置した外板と内板との間にウレタン樹脂等の発泡体を充填して構成したものがあ

【0003】

【発明が解決しようとする課題】上記の従来の外壁パネ

ルは、ケーシング内の冷熱または暖熱が外部へ逃げるのをウレタン樹脂等の発泡体によって阻止できる点で優れるが、ケーシング内に設置したファン等の騒音を低減させるうえで改善が要望されていた。本発明の目的は、空調装置の外壁パネルの防音性能を向上させることにある

【0004】

【課題を解決するための手段】上記の目的を達成するため、請求項1の発明は、例えば、図1・図3・図5・図7の各図に示すように、空調装置の外壁パネルを次のように構成した。即ち、合成樹脂によって額縁状に形成した縁部材6と、その縁部材6の外側面に取り付けた金属製の外板11と、同上の縁部材6の内側面に取り付けた金属製の内板12と、上記の外板11の内面と上記の内板12の内面との少なくとも一方の内面に接合させた防音材15とを備え、上記の縁部材6と上記の外板11および内板12と上記の防音材15とによって囲まれた空間に発泡体Fを充填した、ことを特徴とするものである。なお、上記構成において、上記の防音材15は、外板11の内面だけに接合される場合と、内板12の内面だけに接合される場合と、外板11の内面に接合されると共に内板12の内面にも接合される場合との三つの場合がある。

【0005】上記の請求項1の発明は次の作用効果を奏する。例えば、外板の内面だけに防音材を接合した場合において、ケーシング内のファン等に起因する騒音エネルギーは、まず、外壁パネルの内板および発泡体によって減衰され、次いで、外板の内面に接合した防音材によって減衰され、その後、上記の外板によって減衰されてケーシング外へ伝播する。このため、外壁パネルの透過損失が大きくなり、防音性能が向上する。また、内板の内面だけに防音材を接合した場合においても、上記と同様に作用して防音性能が向上する。そして、外板の内面に防音材を接合すると共に内板の内面にも防音材を接合した場合においては、防音性能がさらに向上する。

【0006】しかも、上記の外壁パネルを製作するときには、外板の内面と内板の内面との少なくとも一方の内面に防音材を予め接合しておき、その外板と内板とを縁部材に取り付けて、その後、上記の縁部材と上記の外板および内板と上記の防音材ととによって囲まれた空間に発泡体を充填すればよい。このように、外板と内板との少なくとも一方に防音材を予め接合しておくだけでよいので、外壁パネルの製作作業に手間がかからない。

【0007】また、前記の目的を達成するため、請求項2の発明は、例えば、図1・図3・図5・図7の各図に示すように、空調装置の外壁パネルを次のように構成した。即ち、合成樹脂によって額縁状に形成した縁部材6と、その縁部材6の外側面に取り付けた金属製の外板11と、同上の縁部材6の内側面に取り付けた金属製の内板12と、上記の外板11の内面と上記の内板12の内

面とのいずれか一方の内面に接合させた防音材15と、他方の内面に接合させた別の防音材とを備え、上記の縁部材6と上記の外板11および内板12と上記の防音材15および別の防音材とによって囲まれた空間に発泡体Fを充填した、ことを特徴とするものである。

【0008】上記の請求項2の発明によれば、上記の防音材の防音構造または材質と上記の別の防音材の防音構造または材質とを組み合わせることにより、所望の周波数領域の防音性能を向上したり、低周波数から高周波数の全領域で防音性能を向上させることが可能となる。

【0009】上記の請求項1又は2の発明においては、請求項3に示すように構成することが好ましい。即ち、例えば図1又は図5に示すように、前記の防音材15を、中空部分Cを備えた合成樹脂製のシートによって構成するのである。その請求項3の発明によれば、上記の中空部分内の気体(例えば空気)によって騒音エネルギーを吸収できるので、防音性能が向上する。

【0010】請求項4の発明は、請求項3の構成において、例えば図5に示すように、前記のシート形の防音材15の厚さ方向に対して直交する方向へ分布する多数の半球状空隙19によって前記の中空部分Cを構成したものである。その請求項4の発明は、多数の半球状空隙内の気体によって騒音エネルギーを効率よく吸収できるので、防音性能がさらに向上する。しかも、シート形の防音材は、上記の空隙を半球状に形成したので、発泡体の発泡圧力や外力による変形を防止できる。

【0011】請求項5の発明は、前記の請求項3の構成において、例えば図1に示すように、前記のシート形の防音材15の厚さ方向に対して直交する方向へ所定の間隔をあけて設けた多数の柱状空隙17によって前記の中空部分Cを構成したものである。その請求項5の発明は、多数の柱状空隙内の気体によって騒音エネルギーを吸収できるので、防音性能が向上する。しかも、シート形の防音材は、隣り合う空隙間を区画するリブによって比較的高い強度を備えることが可能である。

【0012】請求項6の発明は、上記の請求項1から5のいずれかの構成において、前記の発泡体Fが、合成樹脂製の発泡成形材料と二酸化ケイ素を主成分とした無機質の微細粒子との混合物からなる、ことを特徴とするものである。上記の請求項6の発明によれば、発泡体に混入した微細粒子の重量効果等によって外壁パネルの遮音性能を向上できる。しかも、その微細粒子が二酸化ケイ素を主成分とする無機質であるので、外壁パネルのリサイクルが容易である。

【0013】

【発明の実施の形態】(第1実施形態)図1と図2は本発明の第1実施形態を示している。まず、図1(A)と図1(B)とによって本発明に係る外壁パネルの構造を説明する。図1(A)は、空調装置のケーシング1の断面視部分図を示し、図1(B)は、上記の図1(A)中のB-B線矢

視における防音材15の断面図である。

【0014】上記ケーシング1はフレーム2を備え、そのフレーム2の外面に複数枚の外壁パネル3・3が着脱自在で気密状に固定される。符号4はガスケットである。上記の外壁パネル3は、合成樹脂製で額縁状の縁部材6を備える。その縁部材6の外側面(ここでは上側面)の外溝6aに金属製の外板11を嵌着すると共に、同上の縁部材6の内側面(ここでは下側面)の内溝6bに金属製の内板12を嵌着してある。そして、上記の外板11の内面のほぼ全面に防音材15を接合してある。その接合方法としては、接着剤や両面テープを利用することが考えられる。

【0015】上記の防音材15は、中空部分Cを備えた合成樹脂製のシートによって構成されている。より詳しくいえば、その中空部分Cは多数の柱状空隙17によって構成されており、これら柱状空隙17は、上記のシート形の防音材15の厚さ方向に対して直交する方向(ここでは図1(A)中の左右方向)へ所定の間隔をあけて設けられると共に、図1(B)中の左右方向へ長く延びている。図中の符号18は、隣り合う空隙17・17を区画するリブである。なお、上記の柱状空隙17は、ほぼ正方形の断面形状で例示してあるが、その断面形状は長方形または平行四辺形もしくは円形等であってもよい。

【0016】上記の縁部材6と上記の外板11および防音材15と上記の内板12とによって囲まれたパネル空間に、断熱性と防音性を備えた発泡体Fが充填される。その発泡体Fは、ウレタン樹脂と発泡剤とを組み合わせた発泡成形材料を公知の方法によって発泡させてある。

【0017】図2は、上記の第1実施形態と比較例とを比べた試験結果を示し、透過損失と周波数との関係を示すグラフである。上記の第1実施形態に係る試験用の外壁パネル3は、前記の図1に示すように、次のように構成してある。

【0018】外板11と内板12とは、板厚もが約0.6mmの圧延鋼板にメッキを施したものを使用し、縦寸法が約540mmで横寸法が約840mmである。外壁パネル3の厚さは約30mmであり、従って、図1中のT寸法は約29mmである。前記の防音材15は、ポリプロピレン製の平行リブ構造(住友化学工業株式会社製のサンプライ)を使用し、第1テスト例では上記サンプライの厚さHが約3mmのもの(面密度:0.5kg/m²)を使用し、第2テスト例では同上サンプライの厚さHが約5mmのもの(面密度:1.2kg/m²)を使用した。

【0019】発泡体Fは、ウレタン樹脂と発泡剤との組み合わせを用い、その発泡後の密度は40kg/m³であった。上記構成の外壁パネル3の面密度は、第1テスト例では12.79kg/m²で、第2テスト例では13.01kg/m²であった。なお、透過損失の試験時には、上記の外壁パネル3の外周縁部を、ほぼ等間隔に配置した6本のボルトによって試験用ダクトに固定した。

【0020】これに対して、比較例に係る試験用の外壁パネルは、前記の防音材15を設けてない点だけが、第1実施形態に係る試験用の外壁パネル3と異なる。なお、その比較例の外壁パネルの面密度は、 12.13kg/m^2 であった。

【0021】上記の図2の試験結果によれば、本発明の第1実施形態(第1テスト例と第2テスト例)は、比較例と比べて、500Hz未満の低周波数領域で防音性能を向上できることが明らかとなった。

【0022】図3から図8は、第2実施形態から第4実施形態を示している。これらの別の実施形態においては、上記の第1実施形態と同じ構成の部材には同一の符号を付けてあり、その第1実施形態とは異なる構成についてだけ説明する。

【0023】(第2実施形態)図3と図4は本発明の第2実施形態を示している。図3は前記の図1に相当する図で、図4は前記の図2に相当する図である。この場合、前記の防音材15は、中空部分なしの中実シートを使用している。より具体的にいえば、その防音材15は、ゴム系統の遮音シート(日本特殊塗料株式会社製の商標名「イーディケル」M-4000)を使用し、第3テスト例では上記の遮音シートの厚さHが約2mmのもの(面密度:約 3.5kg/m^2)を使用し、第4テスト例では同上の遮音シートの厚さHが約3mmのもの(面密度:約 5kg/m^2)を使用した。なお、上記構成の外壁パネル3の面密度は、第3テスト例では 15.65kg/m^2 で、第4テスト例では 17.20kg/m^2 であった。

【0024】上記の図4の試験結果によれば、本発明の第2実施形態(第3テスト例と第4テスト例)は、前記の比較例と比べて、125Hzから2KHzの周波数領域で防音性能を向上できることが明らかとなった。

【0025】(第3実施形態)図5と図6は本発明の第3実施形態を示している。図5は前記の図1に相当する図で、図6は前記の図2に相当する図である。この場合、前記の防音材15には、ガラス製品などの破損しやすい物を梱包するときの空隙付きクッション材(いわゆるエアキャップ)を使用している。より詳しくいえば、防音材15の厚さ方向に対して直交する方向へ分布する多数の半球状空隙19によって前記の中空部分Cを構成している。なお、その防音材15の全体の厚さHは約3mmで、上記の半球状空隙19の半径は約5mmである。なお、上記構成の外壁パネル3の面密度は、 12.35kg/m^2 であった。

【0026】上記の図6の試験結果によれば、本発明の第3実施形態(第5テスト例)は、前記の比較例と比べて、125Hz以上の周波数領域で防音性能を向上できることが明らかとなった。

【0027】(第4実施形態)図7と図8は本発明の第4実施形態を示している。図7は前記の図1に相当する図で、図8は前記の図2に相当する図である。この場合、

前記の防音材15を、厚さHが約10mmで密度が約 40kg/m^3 のグラスウールによって構成してある。なお、上記構成の外壁パネル3の面密度は、 12.35kg/m^2 であった。

【0028】上記の図8の試験結果によれば、本発明の第4実施形態(第6テスト例)は、前記の比較例と比べて、1KHz以上の周波数領域で防音性能を向上できることが明らかとなった。

【0029】上記の各実施形態は、さらに次のように変更可能である。前記の発泡体Fは、前述した合成樹脂製の発泡成形材料と二酸化ケイ素を主成分とした無機質の微細粒子との混合物によって構成してもよい。その微細粒子は、資源を再利用するため、ガラス容器等のガラス製品をリサイクルしたものを利用することが好ましい。

【0030】なお、上記の発泡体Fの遮音性向上と良好な発泡性とを両立させるため、次のように構成することが好ましい。即ち、前記の微細粒子の粒径が $10\mu\text{m}$ から5.0mmの範囲内であり、発泡前の材料状態では、上記の微細粒子が、前記の発泡成形材料と同上の微細粒子との和に対して、20から95(体積)%の範囲内であることである。さらに好ましいのは、次のように構成することである。即ち、前記の微細粒子の粒径が $10\mu\text{m}$ から1.2mmの範囲内であり、発泡前の材料状態では、上記の微細粒子が、前記の発泡成形材料と同上の微細粒子との和に対して、40から80(体積)%の範囲内であることである。そして、試験結果によれば、上記の微細粒子と上記の発泡成形材料との体積混合割合を発泡前の材料状態ではほぼ1:1に設定した場合には、遮音性能を約2dBも向上できることが分かった。

【0031】前記の外板11と前記の内板12とを前記の縁部材6に取り付ける方法は、嵌着することに代えて、ビス止めや接着等の他の取り付け方法であってもよい。上記の金属製の外板11および内板12は、鋼板にメッキを施したものに代えて、鋼板に塗装を施したもの又はアルミニウムに表面処理を施したものと等であってもよい。

【0032】前記の防音材15は、上記の外板11の内面だけに接合することに代えて、前記の内板12の内面だけに接合してもよい。さらには、上記の外板11の内面に防音材15を接合すると共に上記の内板12の内面にも防音材15を接合してもよい。

【0033】また、上記の外板11の内面に上記の防音材15を接合すると共に上記の内板12の内面に別の防音材を接合してもよい。これに代えて、上記の内板12の内面に上記の防音材15を接合すると共に上記の外板11の内面に別の防音材を接合してもよい。上記の別の防音材としては、前記の各実施形態の各種の防音材15を任意に選んで使用することが考えられるが、各実施形態とは全く異なる種類の防音材であっても差し支えない。

【図面の簡単な説明】

【図1】本発明の第1実施形態を示し、空調装置のケーシングの断面視部分図である

【図2】上記の第1実施形態の試験結果を示し、透過損失と周波数との関係を示すグラフである。

【図3】本発明の第2実施形態を示し、前記の図1に相当する図である。

【図4】上記の第2実施形態の試験結果を示し、前記の図2に相当する図である。

【図5】本発明の第3実施形態を示し、前記の図1に相当する図である。

【図6】上記の第3実施形態の試験結果を示し、前記の図2に相当する図である。

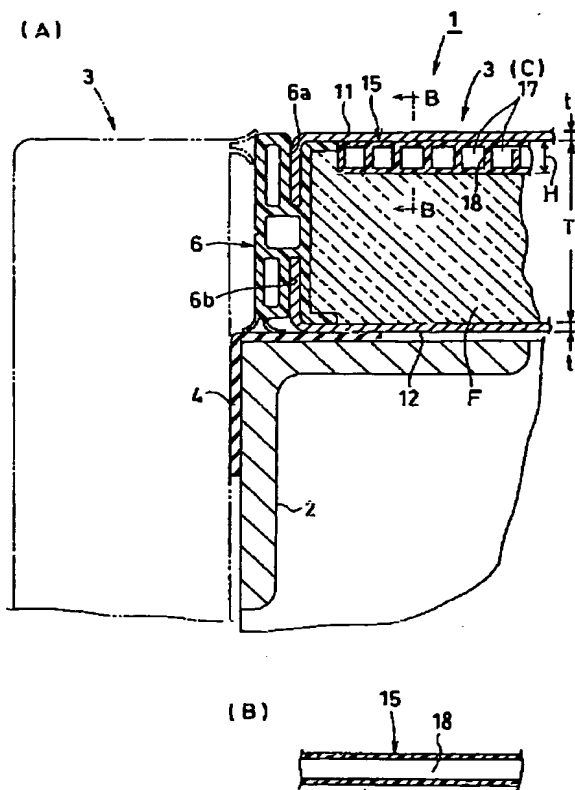
【図7】本発明の第4実施形態を示し、前記の図1に相当する図である。

【図8】上記の第4実施形態の試験結果を示し、前記の図2に相当する図である。

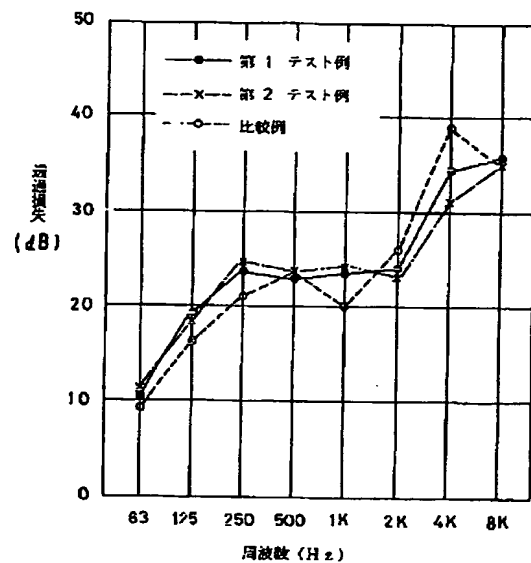
【符号の説明】

6…縁部材、11…外板、12…内板、15…防音材、17…柱状空隙、19…半球状空隙、C…中空部分、F…発泡体。

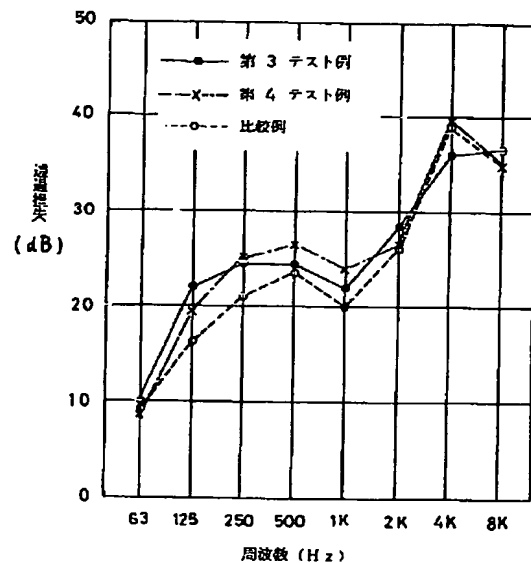
【図1】



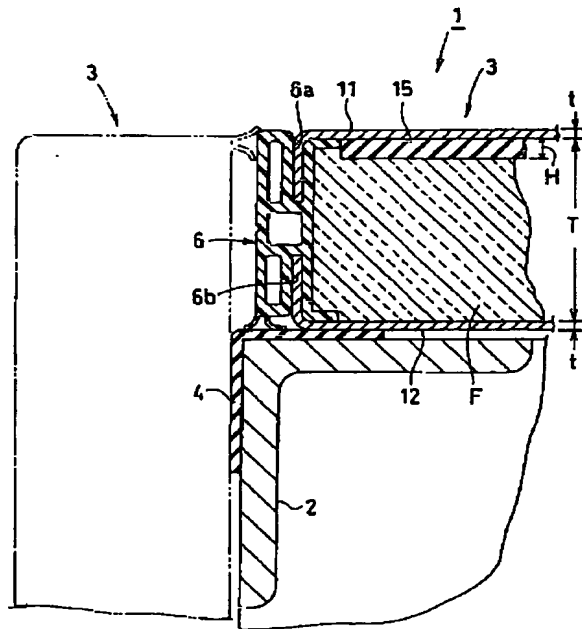
【図2】



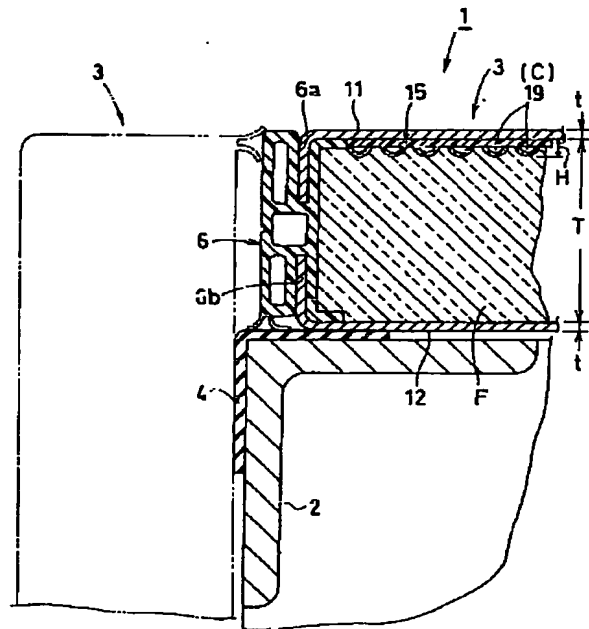
【図4】



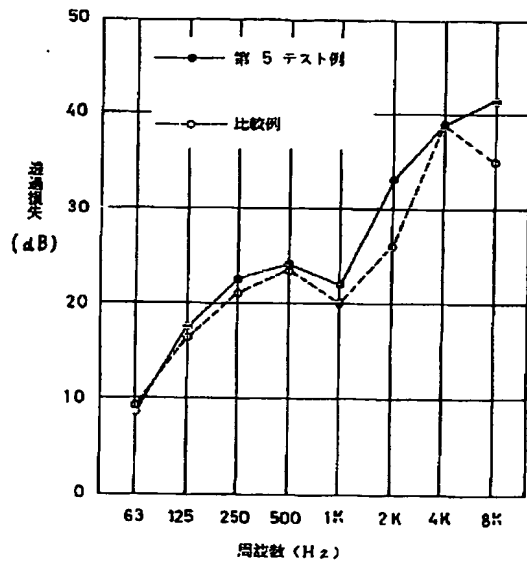
【図3】



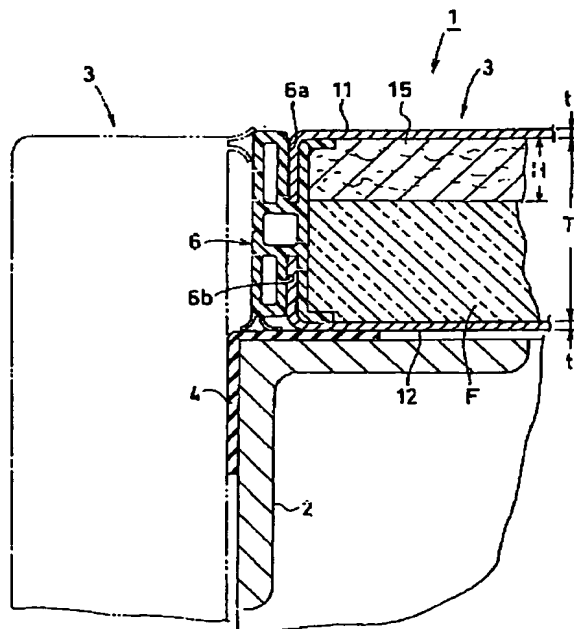
【図5】



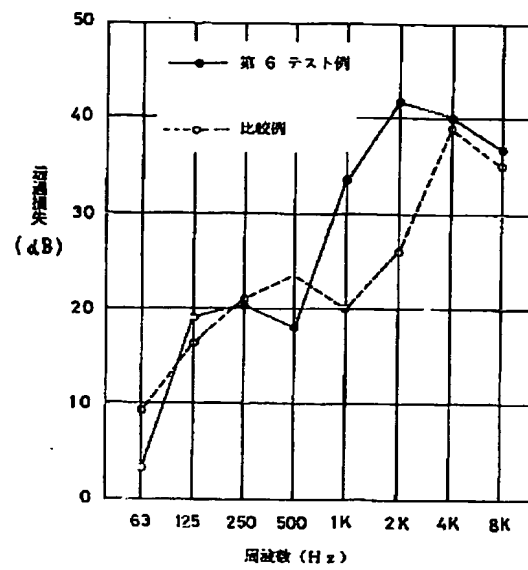
【図6】



【図7】



【図8】



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